Port of New York and New Jersey Water Level and Current Experimental Nowcast/Forecast Model System

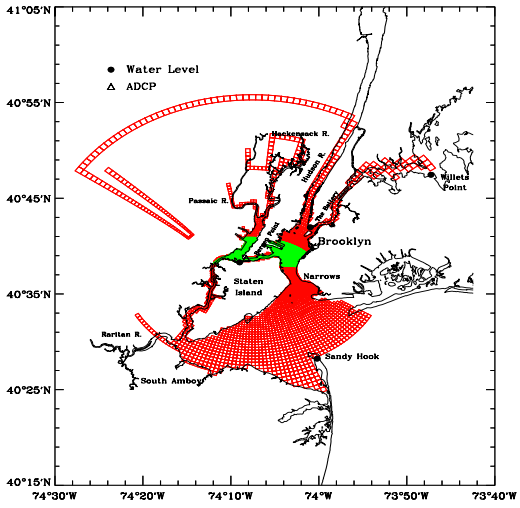
NOAA/National Ocean Service
(http://ocean1.ncd.noaa.gov/nymodel/nylatest.html)

An experimental real-time nowcast/forecast model system for the Port of New York/New Jersey has been implemented and is being tested by the National Ocean Service, NOAA. It is designed to provide mariners and port mangers with near real-time nowcast and forecast water levels and currents throughout the harbor. The model system will be incorporated into NOS's Physical Oceanographic Real-Time System (PORTS) now operating in the harbor.

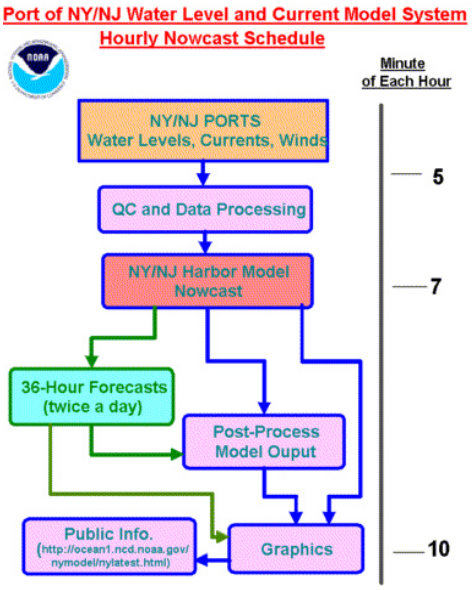
The nowcast/forecast model system, developed by NOS's Coast Survey Development Laboratory (CSDL), uses the 3-D Princeton Ocean Model (POM) for the harbor model. Boundary conditions are provided by an East Coast forecast model system, which is driven by an NWS weather forecast model. POM has an orthogonal curvilinear model grid covering New York Harbor from $74^0$20'W to $73^0$45'W and from $40^0$24'N to $40^0$52'N with a resolution varying from 150 m to 1000 m. A higher resolution sub-grid (green area in figure below), covering the Narrows and the navigation channels approaching Port Elizabeth, is embedded within and coupled to the larger grid, providing grid resolution as small as 70 m. The nested grid system provides more detailed information about current shears and eddies. The model system has been extensively calibrated with observations and has gone through a validation process to pass specific NOS criteria.

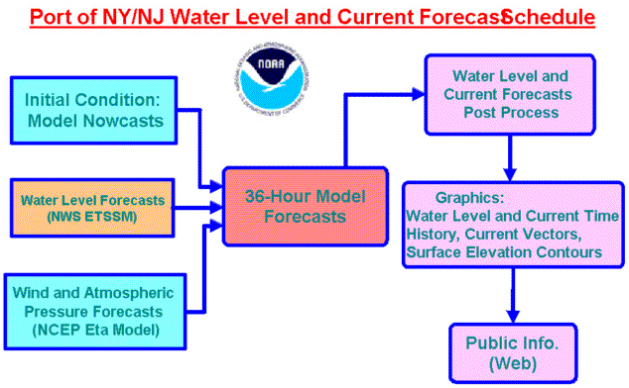
The maritime users in the Port of NY/NJ previously had named almost a hundred locations where they needed real-time information on water level and currents (in addition to the forecasts), much more than could be instrumented with real-time water level gauges and Acoustic Doppler Current Profilers (ADCPs). The NY/NJ model, run in the nowcast mode, provides near real-time information at hundreds of locations.

The Port of New York/New Jersey Water Level and Current Nowcast/Forecast System is currently making nowcasts every hour and 36-hour forecasts twice a day.

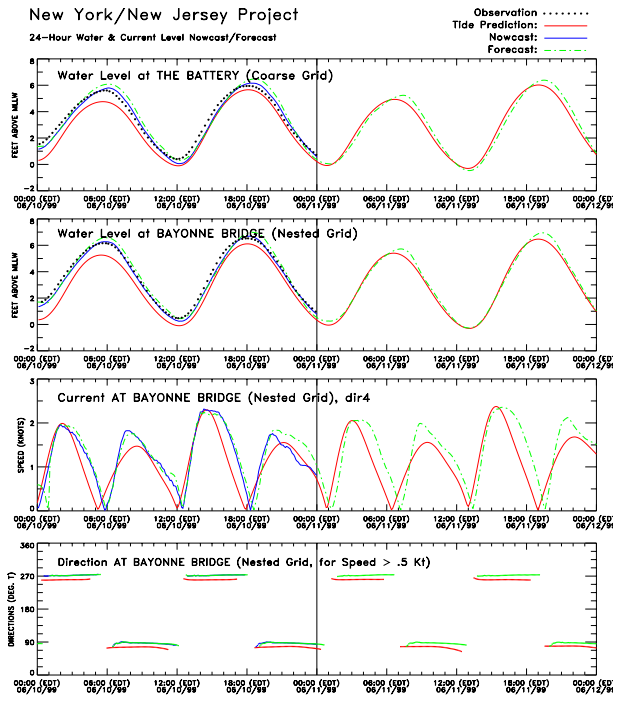


NY/NJ Harbor Nowcast/Forecast System Model Grid





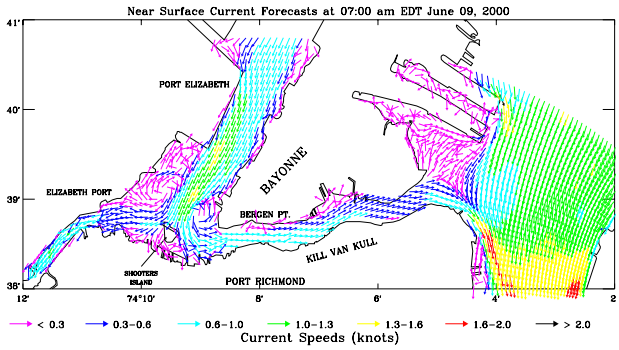
Real-time wind data over the harbor is input into the model, but the non-tidal water level variation within the harbor is greatly dominated by the signal from the continental shelf. In the nowcast model, the real-time water level data from NOS's Sandy Hook water level gauge is used to drive the model and that does a more than adequate job, as shown by the very close comparison between the model-produced nowcasts (blue dash-dotted line) and the actual real-time water level data (black solid line) at two locations within the harbor (Bayonne Bridge and the Battery). In the forecast mode, the NY/NJ model system uses forecast water levels from a coastal ocean forecast model, which is driven by atmospheric forecasts from NWS's Aviation weather model.



Note: Bayonne Bridge Nowcast Current at Layer 2 and Observation at Bin 10 (both about 3 meters below the surface)
Tide prediction at Bin 8 (about 5 meters below the surface)

The Port of New York and New Jersey has a complex geometry with narrow bending navigation channels. These channels are important from both a safe navigation point of view and from a hydrodynamic point of view. Current shears and eddies, generated by lateral inertial effects at the junction of channels (e.g., at Bergen Point) and other locations, are important to pilots and ship captains trying to maneuver large oil tankers and cargo ships. Very high horizontal resolution is required in a numerical model to accurately predict the occurrence of eddies and current shears.

Nowcasts and forecasts of water levels and currents are portrayed on a Website for evaluation purposes at: http://ocean1.ncd.noaa.gov/nymodel/nylatest.html



In addition to the Port of New York/New Jersey Nowcast/Forecast System, CSDL develops the Chesapeake Bay nowcast/forecast system in collaboration with the Center for Operational Oceanographic Products and Services (CO-OPS), the group in NOS that operates and quality controls PORTS. Another nowcast/forecast system is also under development for Galveston Bay and the Port of Houston. The New York and New Jersey system should be transferred to the NY/NJ PORTS operational environment within a year.

For the latest information on model development please send your inquires to **Dr. Eugene Wei** through **e-mail: eugene.wei@noaa.gov.**